

AMENDMENTS TO THE CLAIMS

1. (Currently amended) A gene detecting chip ~~having a plurality of pin electrodes that are measurement poles, characterized in that voltages are applied between said pin electrodes and a common electrode that is a counter electrode for said pin electrodes for enabling detection of currents.~~ comprising:

a body part having a plurality of pin electrodes on an inside surface thereof;

a frame part having a recess on an inner surface thereof and being freely attachable to and detachable from said body part, said frame part being capable of accepting the pin electrodes and of being filled with a nucleic acid sample; and

a common electrode being a counter electrode for the pin electrodes, wherein said common electrode is arranged within the recess in a manner that said common electrode does not come into contact with the pin electrodes.

2. (Cancelled)

3. (Cancelled)

4. (Currently amended) The gene detecting chip according to ~~any one of claims 1 to 3, characterized in that~~ claim 1, wherein genes having different nucleotide sequences are immobilized to said pin electrodes, ~~respectively.~~

5. (Currently amended) The gene detecting chip according to ~~any one of claims 1 to 3, characterized by in that~~ claim 1, wherein a plurality of different nucleotide sequences selected from the group consisting of PCR products, oligonucleotides, mRNA, cDNA, PNA (peptidic nucleic acid), ~~[[or]]~~ and LNA (locked nucleic acid; Proligo, a trademark of LLC), ~~having different nucleotide sequences~~ is immobilized to said pin electrodes.

6. (Currently amended) The gene detecting chip according to ~~any one of claims 1 to 3, characterized in that~~ claim 1, wherein genes having the same nucleotide sequence are immobilized to said pin electrodes, ~~respectively.~~

7. (Currently amended) The gene detecting chip according to ~~one of claims 1 to 3, characterized in that~~ claim 1, wherein PCR products, oligonucleotides, mRNA, cDNA, PNA (peptidic nucleic acid), or LNA (locked nucleic acid; Proligo, a trademark of LLC), having the same nucleotide sequence are immobilized to said pin electrodes.

8. (Currently amended) The gene detecting chip according to claims 6 or 7, further characterized by having a plurality of recesses capable of accepting said pin electrodes and capable of being filled with ~~sample DNA,~~ a nucleic acid sample, so that said plurality of recesses can be filled with different ~~sample DNAs,~~ nucleic acid samples, respectively.

9. (Currently amended) The gene detecting chip according to claim 1, ~~any one of claims 1 to 8, for~~ wherein the chip is capable of detecting gene based sequences, one base substituted SNPs, substitution of several bases, point mutations, translocations, losses, amplifications, or triplet repeats.

10. (Currently amended) The gene detecting chip according to claim 1, ~~any one of claims 1 to 9, characterized in that~~ wherein the surfaces of said pin electrodes are plated with gold.

11. (Currently amended) The gene detecting chip according to claim 1, ~~any one of claims 1 to 10 characterized in that~~ wherein the surfaces of said pin electrodes are partially coated with a resin.

12. (Currently amended) The gene detecting chip according to claim 11, ~~characterized in that~~ wherein said resin is PEEK or PTFE.

13. (Currently amended) The gene detecting chip according to claim 1, wherein ~~any one of claims 1 to 12, characterized in that~~ a supporting member is further provided for supporting said pin electrodes, and said pin electrodes are erected on said supporting member.

14. (Currently amended) The gene detecting chip according to claim 13, ~~characterized in that~~ wherein said pin electrodes are erected on said supporting member with spot electrodes interposed therebetween.

15. (Currently amended) The gene detecting chip according to ~~any one of claims 1 to 12, characterized in that~~ claim 1, wherein a supporting member is further provided for supporting said pin electrodes, and one end ~~[of each]~~ of each of said pin electrodes is implanted on said supporting member.

16. (Original) The gene detecting chip according to any one of claims 13 to 15, wherein said supporting member is a circuit board.

17. (Currently amended) The gene detecting chip according to any one of claims 13 to 16, ~~characterized in that~~ 15, wherein the ends of said pin electrodes, ~~that which~~ are in contact with or implanted on said supporting member, are enclosed by an epoxy resin or PTFE and thereby secured on said supporting member.

18. (Currently amended) The gene detecting chip according to any one of claims 13 to 17, ~~characterized in that~~ genes 15, wherein nucleotide sequences are immobilized only to ends of said pin electrodes that are not the ends in contact with or implanted on said supporting member.

19. (Currently amended) The gene detecting chip according to ~~any one of claims 1 to 18, characterized in that~~ claim 4, wherein genes are fixed over the entirety of said pin electrodes.

20. (Currently amended) The gene detecting chip according to any one of claims 13 to 19, ~~having a gap inside thereof~~ 13, 14, 15 or 19 further comprising a gap therein, characterized in that:

said pin electrodes are deployed on said supporting member so as to protrude into said gap; and

a portion or entirety of said common electrode ~~is exposed~~ extends into said gap.

21. (Cancelled)

22. (Cancelled)

23. (Currently amended) A detecting chip for detecting one base substituted SNP and spot mutation in genes, ~~having~~ comprising a main body part and a frame part that are freely attachable to and detachable from each other, characterized in that:

said main body part has a multiplicity of pin electrodes that are protruding measurement poles arranged in a matrix on the inner surface thereof;

said frame part has a recess on the inner surface thereof[,] that is capable of accepting said multiplicity of pin electrodes when said main body part is mounted ~~[thereto] and thereon~~ and is capable of being filled with sample DNA a nucleic acid sample;

a common electrode, that is a counter electrode deployed so as not to contact said pin electrodes, is provided in said recess; and

PCR products or oligonucleotides having different nucleotide sequences are immobilized to said pin ~~electrodes; and electrodes,~~

wherein voltages are applied between said common electrode and said pin electrodes so as to enable detection of currents.

24. (Currently amended) The gene detecting chip according to claim 23, ~~characterized in that~~ wherein said pin electrodes are arranged in a multiplicity in matrices, and, by inserting the pin electrodes into each of receptacles accommodating PCR products or oligonucleotides having different nucleotide sequences, said PCR products or oligonucleotides having different nucleotide sequences are immobilized ~~[thereto]~~ thereto.

25. (Cancelled)

26. (Currently amended) A gene detection apparatus comprising the gene detecting chip described in any one of claims ~~1 to 25,~~ 1 or 23 and a measurement apparatus which said detecting chip can be loaded into and removed from.

27. (Currently amended) The gene detection apparatus according to claim 26, ~~characterized in that~~ wherein said temperature of said gene detecting chip can be controlled using a Peltier element.

28. (Currently amended) A detection method using the gene detecting chip described claimed in any one of claims ~~1 to 25~~ 4, 5, 6, 7 or 23, comprising the steps of: ~~is used,~~ characterized in that:

filling said recess is filled with the nucleic acid sample or a DNA gene-amplified from the sample; sample DNA or DNA gene-amplified from said sample DNA;

performing a hybridization is performed to form a double-strand nucleic acid; nucleic acid between the nucleic acid sample or the DNA gene-amplified from the sample and any nucleotide sequences immobilized to the pin electrodes having mutually complementary base sequences;

removing from said recess and washing away any unhybridized nucleic acid sample or unhybridized DNA gene-amplified from the sample after said sample DNA or said DNA gene-amplified from said sample DNA is removed from said recess and washed;

filling said recess is filled with an electrolyte containing electrochemically active molecules and such that said electrochemically active molecules are bonded to said double-strand; and double-strand nucleic acid;

applying voltages are applied between said common electrode and said pin electrodes; and

detecting values of currents flowing [therebetween] are detected therebetween.

29. (Currently amended) A detection method using the gene detecting chip described in any one of claims ~~1 to 25~~, characterized in that 4, 5, 6, 7 or 23, comprising the steps of:

filling said recess is filled with the nucleic acid sample or a DNA gene-amplified from the sample sample DNA or DNA gene-amplified from said sample DNA and electrolyte containing electrochemically active molecules, and hybridization is performed molecules;

performing a hybridization to form double-strand nucleic acid; acid between the nucleic acid sample or the DNA gene-amplified from the sample and any nucleotide sequences immobilized to the pin electrodes having mutually complementary base sequences, while said electrochemically active molecules are bonded to said double-strand; and double-strand nucleic acid;

applying voltages ~~are applied~~ between said common electrode and said pin electrodes ~~and electrodes~~; and

detecting values of currents flowing ~~[therebetween] are detected~~ therebetween.

30. (Currently amended) The detection method according to claim ~~28 or 29~~, ~~characterized in that~~ claim 28, wherein said electrochemically active molecules are bonded to said double-strand while controlling temperature.

31. (Currently amended) The detection method according to ~~any one of claims 28 to 30, characterized in that~~ claim 28, wherein said electrolyte containing said electrochemically active molecules has as its effective component, ferrocene, catecholamine, metal bipyridine complex, metal phenanthrene complex, viologen, or a threading intercalator in which those compounds are incorporated.

32. (Cancelled)

33. (New) The detection method according to claim 29, wherein said electrochemically active molecules are bonded to said double-strand while controlling temperature.

34. (New) The detection method according to claim 29, wherein said electrolyte containing said electrochemically active molecules has as its effective component, ferrocene, catecholamine, metal bipyridine complex, metal phenanthrene complex, viologen, or a threading intercalator in which those compounds are incorporated.